ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project APIM 19-007A

ARINC Project Paper 768A: Second Generation Integrated Surveillance System (ISS)

1.1 Name of Originator and/or Organization

Boeing / Jessie Turner

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Chairman

Systems Architecture and Interfaces (SAI) Subcommittee

SAI Chairmen: Reinhard Andreae and Rich Stillwell

Surveillance Working Group Chairman: Jessie Turner

2.2 Support for the activity

Airlines: American, Delta, FedEx, TAP Portugal, UPS

Airframe Manufacturers: Airbus, Boeing

Suppliers: ACSS, Collins Aerospace (TBC), Gables, Garmin, Honeywell

Others: N/A

2.3 Commitment for Drafting and Meeting Participation

Airlines:

Airframe Manufacturers: Airbus, Boeing

Suppliers: ACSS, Garmin, Honeywell

Others: N/A

2.4 Recommended Coordination with other groups

None.

3.0 Project Scope

3.1 Description

This project proposes to create a generational [2nd Generation (2G)] update (ARINC 768A) to the existing ARINC 768 “Integrated Surveillance System (ISS)” characteristic which would support new aircraft designs. It is expected that the ARINC 768A – 2G ISS would result in a >50% reduction in size and weight as compared to currently fielded ARINC 768 ISS Processor Units and a >60% savings in volume and weight (at the aircraft-level). Overall equipment acquisition costs are expected to be reduced and overall reliability is expected to increase.

The Integrated Surveillance System (ISS) represents the integration of standalone aircraft surveillance systems and has resulted in the reduction of the cost, as well as the size, weight, and power (SWaP) requirements, for the suite of the following surveillance functions:

- Air Traffic Control (ATC)/Mode S Transponder

- Automatic Dependent Surveillance – Broadcast Out (ADS-B Out)
- ADS-B In
- Airborne Collision Avoidance System (ACAS-X)
- Terrain Awareness and Warning System (TAWS) with Reactive Wind Shear (RWS)

The initial version of ARINC Characteristic 768: Integrated Surveillance System was developed in 2002-2004, and was first published in October 2005. This characteristic has been successfully used by both Airbus (A380 and A350) and Boeing (787 and 777-8/-9).

In the ~15 years since the first development of the ISS, there have been significant technology advancements in processors and Radio Frequency (RF) components/designs which are expected to result in further reductions in cost and SWaP requirements. Also, with future aircraft designs having a network-based interface design (in lieu of point-to-point ARINC 429/discrete wiring), the equipment can be designed to specifically support network-based interfaces without carrying the overhead of legacy ARINC 429/discrete interfaces. In addition, lessons learned from industry implementations of the ARINC 768 standard can be incorporated into an updated ARINC 768A industry standard.

The Distance Measuring Equipment (DME) function, which currently resides in a standalone ARINC 709 DME Interrogator (along with a dedicated DME antenna), operates in the same L-Band frequency range as the ATC Transponder, TCAS, and ADS-B. The DME function can be included within the 2G ISSPU (and bottom ATC antenna connection) resulting in additional, significant cost and SWaP savings at the aircraft-level.

Lastly, the new ARINC 768A standard should also support a bottom mounted omni-directional antenna (in lieu of a directional antenna). This would provide installation and weight savings, since the omni-directional antenna is smaller/lighter and only requires a single coaxial cable (versus 4 coaxial cables required for a directional antenna).

3.2 Planned usage of the envisioned specification

New aircraft developments planned to use this specification yes ☒ no ☐

Specify: Boeing - new air transport aircraft

Airbus - new air transport aircraft

Modification/retrofit requirement yes ☐ no ☒

Specify:

Needed for airframe manufacturer or airline project yes ☒ no ☐

Specify: Next new Boeing air transport aircraft

Mandate/regulatory requirement yes ☐ no ☒

Is the activity defining/changing an infrastructure standard? yes ☐ no ☒

Specify:

When is the ARINC Standard required? ~~May 2021~~**March 2023**

What is driving this date? Target design date

Are 18 months (min) available for standardization work? yes ☒ no ☐

Are Patent(s) involved? yes ☐ no ☒

If YES please describe, identify patent holder:

3.3 Issues to be worked

It is expected that the following specific items will be addressed as part of the ARINC 768A standard development (and others as they arise):

1) Standardize ISS Processor Unit form, fit, function, and interfaces with reduced SWaP compared to ARINC 768 and determine need to define multiple configurations (for example, with or without TAWS.)

2) Add the Distance Measuring Equipment (DME) function

3) Specify an architecture with a bottom omni-directional antenna connection in lieu of a bottom directional antenna.

4) Specify the ISS connector size, keying, and pinouts to support:
   a) ARINC 664 network-based connections (e.g., fiber)
   b) One directional antenna (4 coaxes) and one omni antenna (1 coax)
   c) Minimize ARINC 429 interfaces

4.0 Benefits

4.1 Basic benefits

Operational enhancements? yes ☐ no ☒

For equipment standards:

a. Is this a hardware characteristic? yes ☒ no ☐

b. Is this a software characteristic? yes ☐ no ☒

c. Interchangeable interface definition? yes ☒ no ☐

d. Interchangeable function definition? yes ☒ no ☐

If not fully interchangeable, please explain: Not applicable

Is this a software interface and protocol standard? yes ☐ no ☒

Specify:

Product offered by more than one supplier yes ☒ no ☐

Identify: ACSS, Collins Aerospace, Honeywell

4.2 Specific project benefits (Describe overall project benefits.)

4.2.1 Benefits for Airlines

- Expected reduced equipment and operating cost (< weight and volume)
- Equipment supplier choices
- Higher reliability (no separate hardware for dual DME installation, and more reliable omni antennas)

4.2.2 Benefits for Airframe Manufacturers

- Common installation(s)/solution(s), less variability
- Equipment volume reduction (reduction in equipment racks, or allows

other avionics equipment to be installed without additional equipment racks)

4.2.3 Benefits for Avionics Equipment Suppliers

- Provide equipment that can be installed on multiple aircraft platforms, across multiple aircraft OEMs.

5.0 Documents to be Produced and Date of Expected Result

ARINC Characteristic 768A, "Second Generation Integrated Surveillance System (2G ISS)", ~~May 2021.~~ **March 2023.**

5.1 Meetings and Expected Document Completion

The following table identifies the number of meetings and proposed meeting days needed to produce the documents described above.

Activity	Mtgs	Mtg-Days (Total)	Expected Start Date	Expected Completion Date
ARINC 768A – 2G ISS	~~4 (plus teleconferences)~~ **Bi-weekly Web Conferences**	~~12~~ **TBD**	October 2019	March ~~2021~~**2023**

6.0 Comments

The working group has faced several technical challenges obtaining consensus on the use of fiber optic to support ARINC 664 network interface. Benefits of the fiber have widely echoed positively among the subcommittee members instead of copper interface, however further alignment is needed. Therefore, the scope of this APIM will need to account for physical layer definition, managed under a different standard (refer to draft APIM 21-006), before objective criteria can be fulfilled for ARINC 768A as it will have direct implication on fiber optic transmitter/receiver performance criteria.

6.1 Expiration Date for the APIM

~~October 2021~~**March 2023**

Completed forms should be submitted to Paul Prisaznuk (*pjp@sae-itc.org*)
AEEC Executive Secretary & Program Director